



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/828,592	04/21/2004	Betty Shu Mercer	TI 36275	5550
23494	7590	04/26/2006	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED			FULK, STEVEN J	
P O BOX 655474, M/S 3999			ART UNIT	
DALLAS, TX 75265			PAPER NUMBER	
			2891	

DATE MAILED: 04/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Advisory Action
Before the Filing of an Appeal Brief**

Application No.

10/828,592

Applicant(s)

MERCER ET AL.

Examiner

Steven J. Fulk

Art Unit

2891

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 13 April 2006 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

- a) ☐ The period for reply expires _____ months from the mailing date of the final rejection.
b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
(a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
(b) ☐ They raise the issue of new matter (see NOTE below);
(c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
(d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☐ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
The status of the claim(s) is (or will be) as follows:
Claim(s) allowed: _____.
Claim(s) objected to: _____.
Claim(s) rejected: _____.
Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:
See Continuation Sheet.
12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08 or PTO-1449) Paper No(s). _____.
13. ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed April 13, 2006 with respect to the rejection of claims 1-6, 10, 16 and 20 under 35 U.S.C. 103(a), see pages 6-10, have been fully considered but they are not persuasive.

a. Applicant argues that neither Datta nor Ashby et al. alone teach the element of subjecting a portion of a barrier layer extending beyond a surface of a surface conductive lead to a dry etch to remove the portion, the dry etch being selective to the barrier layer (pages 6-7). This argument is not persuasive because one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In this case, Datta teaches forming a surface conductive lead (fig. 6, 34) over a barrier layer (26) and a seed layer (28). Applicant asserts that Datta requires a wet etch to be performed on both the barrier layer and the seed layer, however the wet etches disclosed by Datta are embodiments of the broad disclosure of performing "an etch process" (col. 5, lines 60-63) on the seed layer and performing "an etch process" (col. 6, lines 47-50) on the barrier metal. One skilled in the art would understand that "an etch process" could encompass a wet etch or dry etch. As evidenced by the prior art made of record in the final rejection, using a carbon tetrafluoride dry etch

chemistry as described by Ashby et al. to selectively remove a TiW barrier layer was well known in the art.

b. Applicant argues that there is no motivation to combine the references because Datta teaches away from the dry etch chemistry of Ashby et al. According to one embodiment of Datta, it is undesirable to form a significant amount of tin oxide over the barrier layer during the etching of the barrier layer (col. 6, lines 60-63). Applicant argues that this disclosure of Datta teaches away from using the oxygen containing dry etch process of Ashby et al. to selectively etch the barrier layer. This argument is not persuasive because Ashby et al. also teaches the use of a carbon tetrafluoride dry etch chemistry containing either nitrous oxide or chlorine, neither of which would produce a significant amount of tin oxide over the barrier layer during the etch process. Therefore, Datta in view of Ashby et al. teaches the elements of claims 3 and 4 as written, which only require an etch chemistry of carbon tetrafluoride with either nitrous oxide (claim 3) or chlorine (claim 4). The use of carbon tetrafluoride containing oxygen is not explicitly required to reject claim 4 as written.

c. Applicant argues that there is no motivation to combine Datta in view of Ashby et al. because it would require the manufacturing process to randomly jump between wet etch processes in a wet etch chamber and dry etch processes conducted in a dry etch chamber, which would be costly and time consuming. This argument is not persuasive. Applicant admits that dry etches are incapable of etching the copper seed layer, and therefore the only

option is to perform at least one wet etch process for the copper seed layer while forming the surface conductive lead.

Thus, the only issue to address in the combination of Datta in view of Ashby et al. is the motivation to perform a dry etch process that is selective to the barrier layer as taught by Ashby et al. in the etch process to remove the barrier layer of Datta. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

In this case, the motivation to use the conventional dry etch process of Ashby et al. as the etch process in the method of removing the barrier layer of Datta was in the knowledge generally available to one of ordinary skill in the art, as evidenced by the prior art made of record in the final rejection. Crank '974, Fan et al. '771 and Lin '542 taught that it was well known and conventional to perform a selective dry etch on the barrier layer of an interconnect. Wolf taught that an ideal etch process has zero bias (the difference in lateral dimension between the etched image and the mask image), meaning a completely anisotropic etch is most ideal (p. 522). Wolf further taught that dry etching is anisotropic, and therefore has an advantage in dimensional control over wet etching (p. 551-552). Therefore,

one of ordinary skill in the art would have first performed the required wet etch of the copper seed layer, then perform a conventional dry etch on the barrier layer for optimal dimensional control of the barrier layer.

d. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In this case, only knowledge which was within the level of ordinary skill at the time the claimed invention was made was used for the conclusion of obviousness, as evidenced by the prior art made of record in the final rejection.

2. Applicant's arguments with respect to the rejection of claims 7, 8, 17 and 18 under 35 U.S.C. 103(a), see pages 11-12, have been fully considered but they are not persuasive.

a. Applicant argues that Backus '124 alone fails to teach the element of subjecting a portion of a barrier layer extending beyond a surface of a surface conductive lead to a dry etch to remove the portion, the dry etch being selective to the barrier layer. It is the Examiner's position that the combination of Datta '133 in view of Ashby '238, and further in view of Backus '124, teach all the elements as claimed. One cannot show

nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

3. Applicant's arguments with respect to the rejection of claims 9 and 19 under 35 U.S.C. 103(a), see pages 12-13, have been fully considered but they are not persuasive.

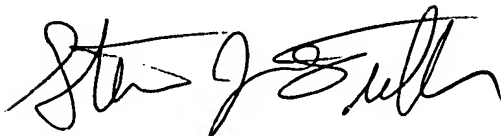
a. Applicant argues that Homma '752 alone fails to teach the element of subjecting a portion of a barrier layer extending beyond a surface of a surface conductive lead to a dry etch to remove the portion, the dry etch being selective to the barrier layer. It is the Examiner's position that the combination of Datta '133 in view of Ashby '238, and further in view of Homma '752, teach all the elements as claimed. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven J. Fulk whose telephone number is (571) 272-8323. The examiner can normally be reached on Monday through Friday, 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

5. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Steven J. Fulk
Patent Examiner
Art Unit 2891

April 19, 2006



BRADLEY K. SMITH
PRIMARY EXAMINER

~~BRADLEY K. SMITH~~
~~PRIMARY EXAMINER~~